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Measuring and Explaining Government Inefficiency in Developing Countries

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WORKING PAPER

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Measuring and Explaining Government Inefficiency in Developing Countries

Nicolas Van de Sijpe[*] and Glenn Rayp[**]

Abstract

We show the relevance of government expenditure inefficiency using the Barro (1990) model. We estimate government inefficiency for 52 developing countries using a data envelopment analysis. The estimated inefficiencies are subsequently used in a general to specific approach in order to identify their determinants. We find the government expenditure inefficiency is primarily determined by governance and political variables, and structural country variables. Economic policy determinants apparently count less. Government inefficiency of the Sub Saharan countries in the sample is substantially higher.

Keywords: Government inefficiency, data envelopment analysis, economic development.

JEL codes: H21, H50, O23.

1 Introduction.

Growth models during the past decades have articulated a *"deep-seeded belief that taxation, public investment, and other aspects of fiscal policy can contribute to growth miracles as well as to enduring stagnation"* (Easterly and Rebelo, 1993, p. 418). In one of the seminal contributions to endogenous growth theory, Robert Barro (1990) awarded fiscal policy a central place. Other authors (e.g. Lucas, 1988, Romer, 1986 and 1990, Azariadis and Drazen, 1990) have stressed the importance of externalities to argue the government has an important role to fulfill in the growth process. In a generic

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model, Zagler and Dürnecker (2003) have shown that the various engines of growth in the endogenous growth literature are closely connected with different categories of the government budget.

If endogenous growth theory has confirmed the expectation of many economists that budgetary policy can be of crucial importance for long-run growth, empirical research has done quite the opposite. For instance, while Easterly and Rebelo (1993) find public investment in transport and communication to be positively related to growth, Devarajan, Swaroop and Zou (1996) report insignificant or even *negative* growth-effects for transportation and communication expenditure. In addition, neither paper uncovers a significant relation between other types of productive expenditure (health, education,…) and growth. In reviewing the existing empirical literature Kneller, Bleaney and Gemmell (1998) report widespread non-robustness of coefficient sign and significance for fiscal variables. In the sensitivity analyses of Levine and Renelt (1992) and Sala-i-Martin (1997a and 1997b) not one fiscal indicator is classified as robust.

One compelling reason for the failure of empirical research to find support for the Barro (1990) model is given by Kneller, Bleaney and Gemmell (1999) and Bleaney, Gemmell and Kneller (2001). These authors show that incompletely specifying the government budget constraint leads to an estimation bias. For example, failure to account for distortionary taxation[1] causes a downward bias in the productive expenditure coefficient. What the estimated coefficient then actually measures is the impact of a unit increase in productive expenditure, at least partly financed by distortionary taxation. According to the theory this effect may be close to zero, which could explain the lack of an empirical relationship between productive public spending and growth. Both papers correct this bias and conclude, for a sample of OECD countries, that productive expenditure (including among others expenditure on education, health, and transport and communication) does stimulate growth, lending strong empirical support to the Barro (1990) model.

Other variables may count as well to explain the disappointing empirical results discussed earlier. In fact, for developing countries it is very likely that government inefficiency plays a more prominent role than distortionary taxation. We see essentially two reasons for this claim. First, in the 1990s, aid represented on average 33.43% of central government expenditure in the 118 low and lower middle income countries (economies with 2001 GNI per capita lower than $2,975) for which data are available (World Development Indicators, 2003). In addition, most developing countries rely on the

[1] This is taxation that influences the investment decisions of agents, with respect to human and/or physical capital (Kneller, Bleaney and Gemmell, 1999, p. 173). Kneller, Bleaney and Gemmell (1999) classify taxation on income and profit, social security contributions, taxation on payroll and manpower, and taxation on property as distortionary.

taxation of domestic goods and services and the taxation of imports and exports for a substantial part of their revenues. None of these taxes profoundly distort investment decisions[2]. Distortionary taxes, such as income taxes and social security contributions, do not seem very important in developing countries (Tanzi, 1987)[3].

The second reason for emphasizing inefficiency is the frequency and magnitude with which it occurs. Pritchett and Filmer (1997) report systematic misallocation of education spending, for the most part due to the strong influence teachers have on resource allocations. The World Development Report 2004 (World Bank, 2003) offers numerous examples of public facilities (schools, health clinics, transportation,…) with severely limited access for poor people. Ablo and Reinikka (1998) and Reinikka and Svensson (2001) reveal that in the first half of the 90s only 13% of central government expenditure on education in Uganda actually reached schools. Estimates show 40% to 94% of public medicine supplies simply disappeared. Filmer, Hammer and Pritchett (1997) refer to a number of studies in other countries that report similar irregularities[4]. The quality of services provided is often low, resulting in bypassing (people go to private facilities or better equipped public facilities, even if this means they have to pay more or travel longer distances) and low utilization of public facilities (Filmer, Hammer and Pritchett, 1997). As a result, countries spending more on education or health do not necessarily achieve better results in these areas, as evidenced by several cross-country studies (Musgrove, 1996, Mingat and Tan, 1998, Filmer and Pritchett, 1999, Rajkumar and Swaroop, 2002, p. 3-5, World Bank, 2003, p. 37-38)[5]. From their estimates Filmer and Pritchett (1999) infer that there are vast discrepancies between the actual public spending per child death averted and cost-effectiveness estimates of the minimum required cost to avert a death for most childhood conditions.

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[2] Kneller, Bleaney and Gemmell (1999) label taxation on international trade as 'other revenues' and not as non-distortionary taxation. However, in the subsequent regression analysis 'other revenues' is not significantly related to growth.

[3] In making this claim we implicitly assume the negative growth effect of an extra unit of distortionary taxation is larger when the level of distortionary taxation in the economy is already high. Otherwise, the bias in the public expenditure coefficient when these taxes are ignored would be more or less the same in a developing country (with low levels of distortionary taxation) as in a developed country (where distortionary taxes are more prominent).

[4] The same authors also provide an illustrative anecdote (Filmer, Hammer and Pritchett, 1997, p. 19). In one low income country a newspaper accused the Ministry of Health of misappropriating $50 million of donor financing. The ministry was appalled and immediately replied this money was misappropriated over a period of *three years* and not one year, as the article implied.

[5] Gupta, Verhoeven and Tiongson (1999) are an exception. Bidani and Ravallion (1997) only find significant effects of public health expenditure on life expectancy and child mortality for poor people, but not for rich people.

In this paper, we measure government expenditure inefficiency in a number of low and lower middle income countries and identify its determinants. First, as a theoretical motivation of this study, we discuss a variant of the Barro (1990) model of public goods and economic growth in which we explicitly consider the role of inefficiency. Though extremely simplified, this model will help to firmly establish a theoretical link between inefficiency and growth. At the same time, it illustrates that failure to account for inefficiency may be a relevant explanation for the lack of a robust empirical relationship between productive public spending and economic growth[6]. This indicates the relevance of measuring government inefficiency in developing countries and of searching for the determinants of this inefficiency.

A direct measure of government inefficiency or a reasonable proxy is, however, not generally available at the country level. A logical solution for this shortcoming is to estimate it instead. In section 3 inefficiency scores are estimated for 52 developing countries, using a non-parametric linear programming-based technique called Data Envelopment Analysis (DEA). Section 3 starts with a short methodological guide to DEA and also contains a justification as to why DEA is chosen over the stochastic frontier (SF) method to measure inefficiency in this specific context. In section 4 estimated inefficiency is used as the dependent variable in a general to specific approach of regression analysis, allowing us to search for the true determinants of inefficiency. Section 5 concludes and draws attention to some policy implications.

2 The Importance of Inefficiency for Growth.

In a basic fiscal policy model (Barro and Sala-i-Martin, 1995, p. 152-158) it is easy to explicitly introduce inefficiency and illustrate how it affects growth. For the ease of the exposition, we omit the time index. We start from the utility function:

$$u(c) = \frac{c^{(1-\sigma)} - 1}{(1-\sigma)}, \qquad (1)$$

[6] Due to data problems for developing countries and methodological issues, we refrain from estimating growth regressions with inefficiency as one of the regressors. In future research, we will address these issues to investigate the empirical influence of inefficiency on growth, and the role of inefficiency in testing the Barro (1990) model.

with constant intertemporal elasticity of substitution equal to $1/\sigma$. c represents per capita consumption. Dynamic optimization of household lifetime utility, subject to a dynamic budget constraint of the form $\dot{a} = w + ra - c$ in every period (w is the wage income, r the interest rate and a stands for wealth, which is assumed to be zero in the initial and last periods: $a_0 = a_T = 0$), yields the well-known result

$$\gamma = \frac{\dot{c}}{c} = \frac{1}{\sigma}(r - \rho), \tag{2}$$

where γ, the growth of income per capita, is positively related to the interest rate r and negatively related to the rate of time preference ρ.

Barro and Sala-i-Martin (1995, p. 152-158) assume a Cobb-Douglas production function for firm i with constant returns in the private inputs labor (L_i) and physical capital (K_i):

$$Y_i = AL_i^{1-\alpha} K_i^{\alpha} G^{1-\alpha}. \tag{3}$$

Aggregate labor force L is assumed constant. G represents *productive* government spending. For fixed G this function exhibits decreasing returns to the accumulation of capital K_i. But when K_i and G are expanded simultaneously, constant returns arise and endogenous growth becomes possible.

The government balances its budget. All productive expenditure G is financed by a proportional tax at rate τ, levied on gross aggregate output. The tax rate is assumed constant over time:

$$G = \tau Y. \tag{4}$$

In (4) it is assumed that the total revenue collected is transformed into productive government spending. This might be a fairly strong assumption. Let us suppose instead that there is not necessarily a one-to-one relationship between productive spending G and revenue, by introducing an efficiency parameter δ ($0 \le \delta \le 1$) that determines the transformation of government revenue into productive expenditure:

$$G = \delta R = \delta \tau Y. \tag{4'}$$

δ is similar to 'iceberg'-type transportation costs in international trade models (e.g. Krugman, 1990, and Krugman and Venables, 1995). We assume a fraction $1-\delta$ of revenues 'melts away', i.e. is not transformed in productive spending, due to different types of inefficiency: misallocation, low quality of public services, waste of resources and the crowding out of private spending (Filmer, Hammer and Pritchett, 1997).

Profit maximization in a competitive economy equals the interest rate to the after-tax marginal product of capital. Setting, as in Barro and Sala-i-Martin (1995), $k_i = \frac{K_i}{L_i} = k \quad \forall i$, we obtain:

$$r = (1-\tau)(\partial Y_i / \partial K_i) = (1-\tau)\alpha A k^{-(1-\alpha)} G^{1-\alpha}. \tag{5}$$

Substituting (3) in (4') yields an expression in G which can be inserted in (5) to solve for the interest rate. From (2) the expression for the (decentralized) income per capita growth rate becomes:

$$\gamma = (1/\sigma)\left[\alpha A^{1/\alpha} (L\tau)^{(1-\alpha)/\alpha} (1-\tau)\delta^{(1-\alpha)/\alpha} - \rho\right]. \tag{6}$$

High inefficiency (a low δ) harms growth, implying that failure to take inefficiency into account in growth regressions can lead to a downward bias in the productive expenditure coefficient, precisely as disregarding distortionary taxation (represented in (6) by the factor $(1-\tau)$) does. It is straightforward to see that the relationship between government inefficiency and economic growth also holds in the case of lump-sum taxes; i.e. when (4) may be written as:

$$G = \delta \overline{R}, \tag{4''}$$

and τ vanishes from (6). Hence, government inefficiency is complementary to distortionary taxation to explain the weak link between productive expenditure and growth. The more inefficient governments are, the more the positive influence of productive expenditure is diminished and, therefore, the more growth rates are reduced. This also implies insight into the determinants of government inefficiency is vital for policy purposes. In the next section government inefficiency is estimated, in section 4 we search for its determinants.

3 Government Inefficiency Estimates Using DEA.

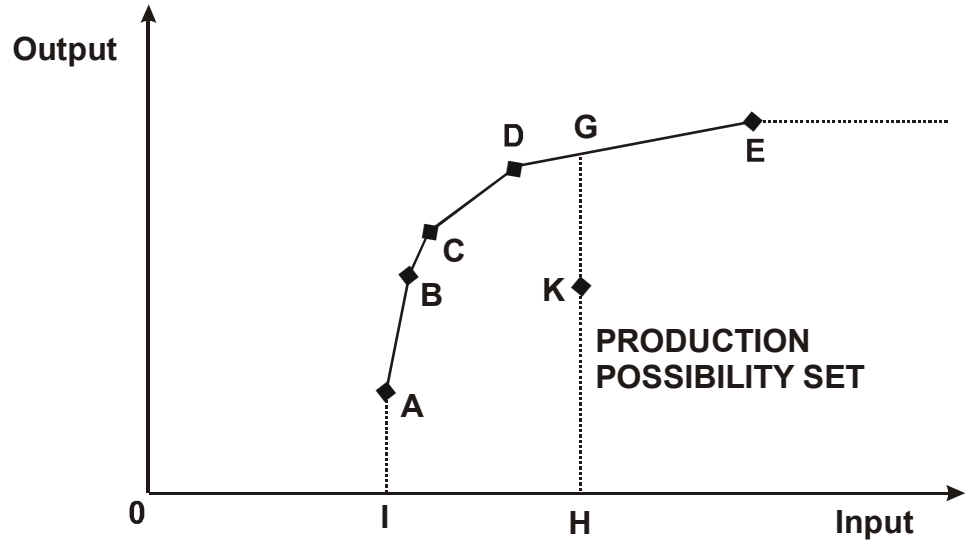
3.1 Methodology.

As far as we could verify, a measure or a proxy of government inefficiency does not exist. This implies that in order to identify its determinants, we first have to derive an estimate of government inefficiency. Here we opt for the Data Envelopment Analysis (DEA) method to estimate inefficiency. DEA is a non-parametric linear programming-based technique designed to calculate relative efficiency. A Banker, Charnes and Cooper (BCC) model allowing variable returns to scale is employed (Banker, Charnes and Cooper, 1984). This is in close accordance with the theoretical fiscal policy models, where the positive effects of productive government expenditure weaken as the government or the expenditure ratios become bigger (Barro, 1990, Devarajan, Swaroop and Zou, 1996).

The BCC-model with one input and one output is illustrated in Figure 1. The first step in measuring inefficiency entails estimating a production possibility frontier. DEA constructs this efficient frontier (the piecewise linear curve IABCDE plus the horizontal line from E) by 'enveloping' the data points according to a number of assumptions (Banker, Charnes and Cooper, 1984, also see Post, 1999, and Thanassoulis, 2001):

- Interpolation between observed input-output-combinations results in new, feasible input-output-combinations. In other words, it is assumed the production possibility set is convex.
- Free disposability: for every input-output-combination it is possible to become less efficient by reducing output or increasing input.
- Inputs and outputs are positive (Bowlin, 1998), a trivial assumption.
- The production possibility set is the smallest set that satisfies these assumptions and contains all observed input-output-combinations.

Figure 1: Output Efficiency in a BCC-Model With one Input and One Output.



Source: own figure, based on Thanassoulis, 2001, p. 10

Next, inefficiency is measured as the distance from the constructed production possibility frontier. Technical output efficiency[7] indicates to what extent output can be expanded with fixed input. In a situation with more than one output, technical output efficiency of a Decision Making Unit (DMU) is *"the maximum proportion any one of its observed output levels represents of the level that output takes when all outputs are expanded radially as far as feasible, without detriment to its input levels"* (Thanassoulis, 2001, p. 24). A radial expansion is the same as an equiproportional expansion, keeping the output mix constant. For DMU K technical output efficiency is measured as HK/HG. This amounts to solving the following linear programming problem (Banker, Charnes and Cooper, 1984, also see Post, 1999, p. 24 and Thanassoulis, 2001, p. 134):

[7] Allocative output efficiency concerns the choice of an optimal output mix, taking prices into consideration. Since the outputs we are concerned with do not have prices, we focus on technical efficiency. Total efficiency is the product of both types of efficiency (Thanassoulis, 2001, p. 27-28).

$$
\begin{aligned}
\hat{\theta}_{BCC,k} = & \max_{\lambda,\theta,s,s'} \theta + \varepsilon\left[\sum_{i=1}^{m} s_i + \sum_{r=1}^{p} s'_r\right] \\
s.t. \quad & \sum_{j=1}^{n} \lambda_j y_{rj} - s'_r = \theta y_{rk} \quad r = 1,\ldots,p \\
& \sum_{j=1}^{n} \lambda_j x_{ij} + s_i = x_{ik} \quad i = 1,\ldots,m \\
& \sum_{j=1}^{N} \lambda_j = 1 \\
& \lambda_j \geq 0 \quad j = 1,\ldots,n \\
& s'_r \geq 0 \quad r = 1,\ldots,p \\
& s_i \geq 0 \quad i = 1,\ldots,m
\end{aligned}
\tag{7}
$$

with y_{rj} the r^{th} output of the j^{th} DMU, x_{ij} the i^{th} input of the j^{th} DMU, s'_r the outputslack for the r^{th} output of DMU k, s_i the inputslack for the i^{th} input of DMU k and ε a non-Archimedean infinitesimal[8]. $\hat{\theta}_{BCC,k}$ represents the inefficiency of DMU k and has a lower bound of 1, attained in the absence of relative inefficiency. Hence, the more efficient a DMU is, the lower the estimated inefficiency score. $1/\hat{\theta}_{BCC,k}$ falls between 0 and 1, and therefore corresponds to the verbal and visual definitions of efficiency given above. In the empirical estimates, we report the inefficiency scores $\hat{\theta}_{BCC,k}$. The optimal slacks, s_i^* and $s_r'^*$, represent non-radial inefficiencies (Post, 1999, p. 24).

A parametric alternative to DEA is the stochastic frontier method (SF) (Coelli, Rao and Battese, 1998, p. 183-219). SF estimates a production function (or cost function) and models the error term in two parts: one reflecting traditional statistical noise (usually assumed to be normally distributed) and one representing inefficiency (with a one-sided distribution, often half-normal or truncated normal). A conceptual advantage of SF is that it deals with random noise, while DEA attributes every deviation from the efficient frontier to inefficiency. As a result, DEA is rather sensitive to measurement error. On the other hand, SF requires an a priori specification of the functional form for the relationship between inputs and outputs, and an explicit distribution for inefficiency.

To compare both methods most authors simulate inefficiency scores by defining an underlying technology and assuming a distribution for the random disturbance and inefficiency. SF and DEA

estimates are then compared to the true, simulated inefficiency, using a number of metrics (rank correlations, mean deviations,…). When DEA is compared to a SF model that is estimated assuming a technology and inefficiency distribution closely related to the ones used in the data generating process, then two types of possible misspecification are ruled out and it is hardly a surprise that SF outperforms DEA (as in Gong and Sickles, 1992). When the technology and the distribution of inefficiency are a priori unknown the risk of misspecification becomes larger, making DEA more appealing (Gong and Sickles, 1992, also see Banker, Gadh and Gorr, 1993)[9]. In a similar study, Read en Thanassoulis (1996) introduce a number of unusual input-output-mixes in an otherwise correctly specified production function. They conclude SF outperforms DEA, but not so at reasonably low levels of noise, where both methods yield comparable results. When inefficiency is introduced in a slightly different manner, less advantageous for SF, severe bias is reported for the SF regression approach (Cooper and Tone, 1997). Resti (2000) uses a piecewise parametric production function in the data generation process to avoid giving parametric techniques an unfair advantage over their non-parametric contenders. DEA and SF produce very similar results, both yielding estimates close to true inefficiency. In small samples (of 50 observations) DEA's relative performance vis-à-vis stochastic methods even improves when more noise is introduced. A recent paper by Banker, Chang and Cooper (2004) claims that, even under the presence of heteroscedasticity, DEA-based estimators give the best results.

To summarize, only in cases where the estimated SF function is close to the underlying technology it seems that DEA is occasionally outperformed by SF. Since we are dealing with a relatively small sample and little is known concerning a production function relating public expenditure to outputs for health, education and government effectiveness, there is a considerable risk of misspecification. Resorting to more flexible forms (such as the translog) is not an adequate solution in small samples (Gong and Sickles, 1992, Ruggiero, 1999, Resti, 2000). In addition, several authors have convincingly argued that SF fails to effectively decompose noise and inefficiency (Banker, Gadh and Gorr, 1993, Ruggiero, 1999, Ondrich and Ruggiero, 2001, Mortimer and Peacock, 2002), indicating SF's ability to cope with measurement error and other random disturbances mainly exists on a conceptual and not on a practical level.

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[8] This is a mathematical construct smaller than any positive number. In practice no real number is used for ε. θ is maximized first and then the sum of slacks is maximized keeping θ to its maximum value obtained (Thanassoulis, 2001, p. 50).

[9] Gong and Sickles (1992) estimate inefficiency in a panel data context, where *unconditional* inefficiency can be estimated under the assumption that it does not change over time. In a cross-country setting, SF can only estimate *conditional* efficiency, which may influence results.

A few authors have undertaken efforts to estimate government inefficiency. Gupta and Verhoeven (2001) gauge inefficiency in health and education expenditure for a sample of developing countries, while Afonso, Schuknecht and Tanzi (2003) relate public spending to a broad set of output indicators for 25 industrialized countries. Both papers conclude there are wide disparities among countries in the way public expenditure is transformed into outputs, again highlighting the importance of inefficiency. Although our empirical approach to estimate inefficiency roughly resembles the methodology Afonso, Schuknecht and Tanzi (2003) and Gupta and Verhoeven (2001) adopt, some modifications are introduced. For instance, both papers apply Free Disposable Hull (FDH) to estimate inefficiency. FDH is a DEA model that only considers other existing DMUs and not fictitious DMUs, constructed under the convexity assumption, as reference units (see Post, 1999, p. 62-64). Because there is no reason to assume that any convex combination of two DMUs should not be attainable and because the BCC estimator has better finite sample properties than the FDH estimator (Post, 1999, p. 62-64), we apply a BCC model. In any case, the disparity between both methods should be small. Other differences regard the choice of outputs and the type of inefficiency measured.

3.2 Data.

In this paper we focus exclusively on developing countries. We have tried to find the relevant data for all 118 countries the World Bank classifies as low and lower middle income economies (with 2001 GNI per capita lower than $2,975). Due to missing observations the sample was reduced to 52 countries. All data in this section are from the World Development Indicators (2003), unless stated otherwise.

One input is considered: central government expenditure per capita based on purchasing power parity (PPP). Outputs are grouped in three relevant domains: health, education and government effectiveness[10]. Outputs for health are infant mortality and immunization against measles. The two education outputs are the youth illiteracy rate and secondary school enrolment. The third dimension consists of one output: 'government effectiveness', taken from Kaufmann, Kraay and Mastruzzi (2003). This variable combines responses on the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of civil service from political pressures, and the credibility of the government's commitment to policies. Therefore, it measures how

[10] Other outputs worth considering would be inequality and infrastructure. Unfortunately, consistently measured inequality data are not available for a lot of developing countries. Infrastructure is usually measured as a stock variable (amount of paved roads, railroad lines,…) from which it is hard to disentangle the current effect of government expenditure. First differencing is an option, but this would substantially increase measurement error. Also, first differencing would favor governments in countries that start from low levels of infrastructure.

well the government is equipped to implement good policies and deliver public goods. Table 1 gives an overview of the selected input and outputs.

Table 1: Selected Input and Outputs for the Government Inefficiency Measures

INPUT
Central government expenditure per capita based on purchasing power parity, 1990-1994 average
OUTPUTS
Health
Infant mortality (per 1,000 live births), 1995-1999 average
Immunization against measles (% of children under 12 months) , 1995-1999 average
Education
Youth illiteracy rate (% of people ages 15-24) , 1995-1999 average
Secondary school enrolment (% gross) , 1995-1999 average
Government effectiveness
Government effectiveness, observation for 1996

Note: all variables from World Development Indicators, 2003, except government effectiveness, which is taken from Kaufmann, Kraay and Mastruzzi (2003)

3.3 Results

To allow for a lagged effect of public spending, expenditure is averaged over the period 1990-1994, while outputs are evaluated in the second half of the 90s (see Table 1). Three different technical output inefficiency scores are estimated[11]. INEFFIC5 relates public expenditure to all 5 outputs. Since child mortality and youth illiteracy are *bads*, a transformation is necessary to conform to the isotonicity property. This property states that *"an increase in any input should result in some output increase and not a decrease in any output"* (Bowlin, 1998, p. 17). One possibility would be to take complements, subtracting the observations for child mortality (youth illiteracy) from 1,000 (100). However, subtracting child mortality from 1,000 greatly reduces the relative distance between governments, giving the impression that every country does relatively well in this output. This brings every

[11] We focus on output inefficiency – and not input inefficiency – because it is more relevant for governments in developing countries. Despite the sizeable debt burdens plaguing some of these countries, the relevant question to be answered is not how the same results can be achieved with less expenditure, but how better results can be obtained from the same amount of spending.

government closer to the production possibility frontier, leaving little room for a radial expansion of outputs. Therefore, we use the reciprocals of child mortality and youth illiteracy as outputs. This has the advantage of leaving relative positions of governments unchanged[12]. A similar problem arises for government effectiveness, roughly situated between -2.5 and 2.5. Since an affine displacement does not alter the efficient frontier, Bowlin (1998) suggests adding the same positive amount to the values of the variable concerned for all DMUs in order to solve the non-positivity problem. However, in a BCC output orientated model an affine displacement of outputs does affect the inefficiency scores of those DMUs not on the efficient frontier (Lovell and Pastor, 1995). For that reason, we project the observations for government effectiveness on a [0,1]-interval, instead of adding an arbitrary number to them. For INEFFIC3, each dimension is represented by one output. These 3 outputs are constructed as the averages of the relevant original outputs for every dimension, after rescaling them to a [0,1]-interval. INEFFIC1 has only one output indicator, calculated as the average of the 3 outputs used to estimate INEFFIC3. To save space we only report the results for INEFFIC1 in Table A1 in appendix, where we have ranked countries from most to least efficient. Correlations with INEFFIC3 and INEFFIC5 are 0.908 and 0.868, respectively.

China, Malawi and Russia achieve an inefficiency score of 1, while Sri Lanka and Thailand come very close to the efficient frontier. Several authors have drawn attention to the accomplishments of China and Sri Lanka with regards to health and education (Perkins, Radelet, Snodgrass, Gillis and Roemer, 2001, p. 354-355, Filmer, Hammer and Pritchett, 1997, p. 12-13, Musgrove, 1996, p. 44-45), so it is no surprise they do well here. Sub-Saharan African countries are almost entirely clustered around the higher inefficiency scores. One exception is Malawi. Malawi has the lowest PPP public expenditure per capita in the sample, so it is automatically placed on the efficient frontier (see figure 1). Restricting our attention to the output indicator we can see Malawi does not do well at all and is even situated in the worst quarter. This is a practical example of the fact that variable returns to scale models tend to overestimate efficiency in small samples, especially at sample extremes (Resti, 2000, Yu, 1998). In our sample this is only a minor problem, since the 'next' efficient country (in figure 1 this would be point B) is China with both very low public expenditure per capita and a high output indicator. The correlation of INEFFIC1 with an inefficiency measure estimated without Malawi exceeds 0.999. Only a few countries are affected and even for them changes in inefficiency scores are almost negligible.

[12] Suppose country A and B have a child mortality of 50 and 10, respectively. Since child mortality is a *bad*, country A could do 5 times better. Taking reciprocals gives 0.02 for A and 0.1 for B as *good* output. Again, we find that A could do 5 times better, if only it was as efficient as B in reducing child mortality. Subtracting observations from 1,000 gives 950 for A and 990 for B, leaving almost no room for A to expand its output.

Correlations of INEFFIC1 with an inefficiency measure based on estimations for a broader set of countries[13], both with and without Malawi, exceed 0.99.

As can be seen from Table 2 the mean inefficiency score, excluding the clear outliers Malawi and the Democratic Republic Congo (DRC), is 1.55. This means the composed output indicator could on average be expanded by more than 50%, keeping input fixed. This quite large – but definitely not implausible – figure simply follows from the fact that we have lumped outputs together. When more than one output is considered, DEA automatically attaches greater weight to any output for which a government does relatively well, thereby reducing (the variation between) inefficiency scores. Mean inefficiency in the same sample of 50 countries for INEFFIC3 and INEFFIC5 is 1.27 and 1.16, respectively. However, even for INEFFIC5 and INEFFIC3 government inefficiency among countries can vary substantially, as the descriptive statistics in Table 2 show.

Table 2: Descriptive Statistics for Different Government Inefficiency Measures

	INEFFIC5	INEFFIC3	INEFFIC1
Mean	1.15	1.27	1.55
Minimum	1	1	1
1st quartile	1	1.06	1.15
Median	1.06	1.21	1.43
3rd quartile	1.22	1.41	1.68
Maximum	1.80	2.30	3.32
Standard Deviation	0.21	0.28	0.53

Note: INEFFIC1, INEFFIC3 and INEFFIC5 are government inefficiency measures, estimated with Onfront 2.0, for the full sample of 52 countries. See the text in this section for more information. Results for all countries for INEFFIC1 are given in Table A1 in appendix. To calculate the descriptive statistics Malawi and the DRC are excluded.

Our measurement of government inefficiency might however be affected by an imperfect mapping of input to outputs. Although the input comprises *total* government expenditure, the outputs do not represent the full range of matters touched upon by government intervention. For instance, countries allocating a large chunk of their spending towards infrastructure investment could end up with a higher government inefficiency measure, because the good state of their infrastructure (that is,

[13] Searching data for all countries included in the 2003 World Development Indicators expanded our data set to 85 observations.

assuming their infrastructure spending is efficient) is not taken into account, and they have less resources left to divert towards the outputs we *do* consider in our inefficiency measure[14].

A correction for this potential bias would be to compute government inefficiency using the expenditure categories directly allocated to the outputs considered. However, at present no disaggregated data are available that would allow us to do this for a sufficiently large number of countries. In any case, we expect the influence of expenditure allocation on the estimated inefficiency to be small. It is highly likely that government inefficiency in infrastructure is strongly correlated with the inefficiency in other spending components (health, education,…). One oft heard reason why public services fail poor people, is that these people do not even have the means to reach the site where services are provided (World Bank, 2003). Lack of decent infrastructure makes it difficult to provide a range of high quality public services to every citizen. Secondly, the provision of high quality infrastructure creates a benign market environment for investments in human capital, raising the demand for health and education. Furthermore, in computing inefficiency, DEA favors the output for which a country does relatively well. Thus, in the efficiency measures with more than one output, the countries that are identified as inefficient are basically the ones who do bad (relative to the other countries) on every output[15]. Therefore, it is less likely that adding one or two outputs would seriously influence the estimated inefficiency.

4 The Determinants of Inefficiency: a General to Specific Approach.

In this section, INEFFIC1 is used as the dependent variable in a general to specific approach of regression analysis (Charemza and Deadman, 1992, Hoover and Perez, 2000). To our knowledge, there have not been any previous attempts to model government inefficiency empirically. The general to specific approach is adopted because a comprehensive theory for the explanation of inefficiency is absent. General to specific avoids the worst excesses of data mining, where researchers attempt several different combinations of candidate variables for a given data set, in search of 'the best regression'. One of the main criticisms against general to specific is that sequential test procedures using conventional critical values understate the true size of the joint test implicit in the search procedure. This would allow too many irrelevant variables to survive the search procedure. Hoover and Perez

[14] Similarly, no outputs associated with military spending are included.

[15] This only applies to the inefficiency measures with more than one output. The inefficiency measure with one output that we use as our dependent variable is, however, strongly correlated with these inefficiency measures (cf. supra).

(2000) have refuted this criticism by showing their particular application of the general to specific methodology maintains a size near the nominal size of the employed tests. They also find a power very close to the true power one should find if the specification were not in doubt, leading them to conclude general to specific outperforms the robustness analyses proposed by Levine and Renelt (1992) and Sala-i-Martin (1997a and 1997b). It is also well known that omission of relevant variables causes bias while including irrelevant variables only leads to less precise estimates. Thus, little can be said in favor of a simple-to-general approach (see Greene, 2003, p. 148-152).

Table A2 lists all the regressors included in the general model. They are grouped under five headings: structural country and past policy variables, governance indicators, and political, external assistance and economic policy variables. Though the structural country variables are exogenous to the current government and are hardly or not under its control when taking policy initiatives, they could affect inefficiency or could have a direct impact on the outputs considered (see Gupta, Verhoeven and Tiongson, 1999). For example, a higher GDP per capita and a lower illiteracy rate indicate a country starts from a higher level of human skills and economic capital, from which we expect a positive effect on government efficiency. To some extent these variables also capture past policy and past inefficiency. A persistent neglect of education by past governments, for instance, would mean the current government has to deal with higher adult illiteracy. Also included is a measure of natural resources, as Gylfason (2001) argues abundant natural resources lead to the neglect of education (the primary sector has less stringent educational demands), rent seeking and economic policy failures. We further include military spending (as a % of central government spending), because our measurement of government inefficiency might be affected by an imperfect mapping of input to outputs (cf. supra). Ideally, we would also like to include the share of spending that is allocated towards infrastructure investment but, unfortunately, such data are not available for a sufficient number of countries. Including military spending allows us to check, at least to some extent, whether the automatic effects discussed above are important or not.

The governance indicators, projected on a [0,1] interval to simplify the interpretation of results, and the political variables grasp the two routes of accountability in service provision, extensively described in the World Development Report 2004 (World Bank, 2003). The short route runs directly from citizens/clients to service providers, while the long route involves citizens influencing politicians who, in their turn, can influence service providers. Because of reduced political risk and increased accountability and transparency, we expect countries with higher governance scores (i.e. better rule of law and control of corruption, a more stable political regime and more press freedom), more political freedom, and less involvement in armed conflict, to be more efficient.

The external assistance variables are added to the general model to check whether IMF programs and development assistance have been able to strengthen government efficiency. IMF assistance is conditional to a structural adjustment program of deregulation and privatization in order to restore the market incentives in the economy, in which the state returns to its core tasks and is disciplined by market sanctioning. Another condition the IMF often imposes is fiscal austerity. Insisting governments cut their budget deficits should also prompt them to raise efficiency. In addition, development assistance, i.e. the transfer of capital goods (e.g. IT infrastructure), technology and human skills to less developed countries, may have a positive effect on government efficiency.

Economic policy variables are included in the analysis to reflect the market orientation of a government. We expect that more international trade (a higher level of integration in the world economy) compels the government to more market discipline and hence increases government efficiency. A similar reasoning might apply to MONEYGROWTH, the variable we consider as a proxy for the tendency of the government to revert to monetary financing of budget deficits. A higher rate of MONEYGROWTH may imply less budgetary discipline and hence a reduced incentive towards expenditure efficiency. LIQLIAB is included because a better developed financial system could reduce the possibility to rig the financial system, thus putting more pressure on the government to control its budget by working in an efficient manner. On the other hand, better developed financial systems could make it easier to domestically finance deficits. The sign of FDI is a priori ambiguous. In general, as a proxy for integration in the world economy complementary to trade openness, we may expect that a higher inflow of foreign direct investments forces the government to behave in a more free market compatible way and to comply with the higher governance standards that multinational corporations expect. However, foreign direct investments in developing countries may also be linked to rent extraction and rent sharing between the political elite and the foreign corporations, leading to favoritism, corruption,… and, ultimately, more inefficiency (Todaro and Smith, 2003).

We start from the following general semi-log model:

$$Log\ INEFFIC1_j = \beta_0 + \sum_{i=1}^{n} \beta_i X_{i,j} + \varepsilon_j, \quad (8)$$

with natural logarithm of INEFFIC1 as the dependent variable, X_i the determinant $i\ (i = 1,\ldots,n)$ of the potential n determinants of government inefficiency we identified and ε_j the usual white noise error term. The model is estimated with OLS. In the specification process, we sequentially drop the variables with the highest p-value until all variables are significant on a 10% significance level. White's heteroscedasticity-consistent standard errors are used to correct for possible

heteroscedasticity. Our search for the determinants of inefficiency is conducted over different samples to examine the influence of outliers (see the note under Table 3). Because of the missing values for some of the variables included in the general model the search path from the general to the specific model may be disturbed by a sample selection bias. For instance, when CONTROLCORR is dropped, 6 new observations enter the analysis. The additional information contained in these observations seriously affects coefficients and p-values of the remaining variables. When we keep the number of observations constant, the effect on the other variables and coefficient of determination is minimal, as one would expect. To avoid that results are influenced by fluctuations in the number of observations, four different general models are considered as starting points (again, see the note under Table 3), gradually excluding more of the variables with missing observations. None of these variables ever remain significant when we start from a general model where they are included[16].

We report our results in Table 3. All the search paths lead to a very similar specific model, except for the model in column (5), where GDPCAP (with the wrong sign) and FHPOLRIGHTS enter the final specification[17]. However, both variables are only significant on a 10%-level while most other variables are significant on a 1%-level. Compared to the models in columns (4) and (6) in Table 3, who have the same number of observations, the model in column (5) has a lower adjusted R^2 and higher information criteria. Therefore, we do not further consider this model. Instead, we focus on the models in columns (3) and (6), which have the highest adjusted R^2 and lowest information criteria of all the models considered with the same number of observations. Also, the models in columns (3) and (6) are arrived at from following a very stable search path.

A considerable part of the variation in inefficiency can be explained by the variables included in the models in column (3) and column (6) in Table 3. With respect to the five groups of potential explanatory variables we distinguished, government inefficiency in the low and lower middle income countries in our sample is mainly determined by governance, political variables and country characteristics. Sub-Saharan African countries are, on average, about 25% less efficient. There are some indications that foreign direct investment is associated with higher inefficiency, contrary to the

[16] For two of these variables there are additional reasons justifying their exclusion. CONTROLCORR could be endogenously determined. As regards IMF (in fact only lacking one observation), it has been argued that failure to account for non-observable factors influencing the likelihood of a government entering into an IMF agreement (especially political will), results in an inability to capture the inherent effect of an IMF agreement (Przeworski and Vreeland, 2000, Vreeland, 2003). If countries with an IMF agreement indeed have more 'political will', this would push towards a negative coefficient for IMF. The fact that we do not find this suggests IMF agreements do not seem to have strong efficiency improving effects.

[17] Recall from Table A2 that a higher value for FHPOLRIGHTS reflects less political freedom, so this variable has the expected sign.

general expectation. Countries with more adult illiteracy and a larger share of young people in total population produce less output for a given amount of public expenditure. A one standard deviation increase in these variables results in an increase in inefficiency scores of some 9%. One standard deviation increases in POLSTAB and LAW reduce inefficiency with 6% and 10-11%, respectively. The occurrence of these variables offers empirical support to the routes of accountability discussed in the 2004 World Development Report (World Bank, 2003). The effect of a standard deviation increase in POLCON on inefficiency is about 7%. The positive sign of POLCON indicates that – after controlling for political stability and rule of law – political constraints, limiting the ability of politicians to pursue their preferred course of action, hamper government efficiency.

Table 3: Specific Models Explaining Inefficiency

	(1) S1GM1	(2) S1GM2 =S1GM3 =S2GM1 =S2GM2	(3) S1GM4	(4) S3GM1 =S3GM2	(5) S3GM3	(6) S3GM4
CONSTANT	0.058	0.050	0.20	0.20	-0.39	0.19
	(0.40)	(0.33)	(1.30)	(0.15)	(-1.33)	(1.22)
DSAFR	0.22**	0.19**	0.22**	0.27**	0.20**	0.24**
	(3.42)	(2.75)	(3.46)	(4.20)	(2.87)	(3.51
FDI	0.039**	0.036**	0.030	0.063**	0.068**	0.060**
	(2.11)	(2.15)	(1.69)	(2.69)	(2.79)	(2.57)
FHPOLRIGHTS					0.038*	
					(1.80)	
GDPCAP					2.99E-05*	
					(1.81)	
ILLITERACY	0.0059**	0.0051**	0.0043**	0.0045**	0.0050**	0.0039**
	(4.38)	(3.65)	(3.17)	(3.56)	(3.65)	(2.96)
LAW	-0.66**	-0.62**	-0.53**	-0.53**	-0.56**	-0.51**
	(-4.26)	(-4.17)	(-3.53)	(-3.61)	(-3.48)	(-3.37)
POLCON	0.32**	0.34**	0.31**	0.27**	0.52**	0.29**
	(4.22)	(4.67)	(4.41)	(3.60)	(4.43)	(3.80)
POLSTAB			-0.31**	-0.34**		-0.33**
			(-3.41)	(-3.50)		(-3.37)
POPYOUNG	0.010**	0.012**	0.012**	0.011**	0.015**	0.012**
	(3.10)	(3.31)	(3.24)	(2.81)	(3.00)	(0.0039)
PRIVHEALTH		-0.00084**	-0.00075**		-0.0011**	-0.00073*
		(-3.21)	(-2.21)		(-3.16)	(-1.82)
R^2	0.79	0.80	0.83	0.83	0.83	0.84
Adjusted R^2	0.75	0.76	0.79	0.80	0.78	0.80
Observations	44	44	44	43	43	43
Akaike	-0.77	-0.80	-0.91	-0.93	-0.81	-0.95
Schwarz	-0.47	-0.47	-0.54	-0.60	-0.41	-0.59

Note: This table reports the specific models starting from different samples and general models. **(*) denotes significance at 5(10)% level. White's heteroscedasticity-consistent standard errors are used to correct for possible heteroscedasticity. t-statistics are reported in brackets. Sample is indicated by the letter S: S1 stands for the full sample (excluding only Malawi and The DRC), S2 also excludes obvious outliers for MONEYGROWTH (Bolivia, Nicaragua and Peru), S3 excludes additional outliers (Swaziland for FDI, Nicaragua for ODACAP and South Africa for PRIVHEALTH).

General model is indicated by GM: GM1 includes all variables, GM2 excludes CONTROLCORR, GM3 also excludes LIQLIAB and MONEYGROWTH, GM4 excludes IMF as well. Since S1GM3=S2GM3 and S1GM4=S2GM4 this strategy yields at most 10 different final specifications.

Since PRIVHEALTH only relates to one of the output dimensions, it is no surprise the impact of this variable is quite small[18].

We controlled whether sample bias might explain the somewhat unexpected sign of the effect of FDI on government inefficiency. For several countries FDI is not available for the second half of the 80s, preventing us from fully exploiting the available data set. Therefore, as an additional test, we replace FDI with FDIFULL. To construct FDIFULL missing observations for FDI are replaced with the observation in the first available year after 1989 (1990 for Romania and Yemen, 1993 for Belarus and Mongolia, and 1994 for South Africa). Repeating the above analysis with FDIFULL yields very similar specific models as the ones reported in Table 3 (available on request) and does not change anything about the qualitative interpretation of the results.

We conduct several sensitivity analyses in the sample excluding all outliers and starting from the general model without CONTROLCORR, LIQLIAB, MONEYGROWTH and IMF. First we check whether ethnic diversity has a more complex effect on government inefficiency (see Collier, 2001). It could well be the negative impact of ethnic diversity is very low for both very homogeneous and very heterogeneous societies. To test this, ETHNICDOM is constructed as a dummy for countries with a value for ETHNIC between 0.4 and 0.65. Yet, this variable is not withheld in the final specification. Adding ETHNIC² or ETHNIC*FHPOLRIGHTS next to ETHNIC in the general model, allowing for non-linearities and interaction effects in the relationship between ethnic diversity and inefficiency, does not change the final specification either. A second sensitivity analysis concerns the (insignificant) effect of development assistance on government inefficiency. ODACAPWDI is the net received official development assistance per capita (PPP), calculated as the product of aid as a % of GNI with PPP GNI, using aid data from the World Development Indicators (2003) instead of OECD's Statistical Compendium. Often, development assistance is not used to buy local goods and services but is spent on international markets, with payments being made in US$. Therefore, we also check whether ODACAP$, the net received official development assistance per capita expressed in US$ (OECD, Statistical Compendium, edition 01#2003), significantly affects inefficiency[19]. Again, neither variable is significantly related to inefficiency.

[18] A one standard deviation increase reduces inefficiency with about 6%. Perhaps private health expenditures are also a proxy for private education expenditures, for which we have no data. This would explain why PRIVHEALTH influences inefficiency even though it only relates to one of the three output dimensions.

[19] Nicaragua is removed as an outlier for ODACAPWDI, but not for ODACAP$. For the latter variable, Nicaragua's value is more in line with those of the other countries.

Development assistance may, however, be endogenous to government inefficiency (see Bräutigam and Knack, 2004). Many donors allocate resources towards countries with improving institutional quality. On the other hand, donors are often called upon to relieve distress in those countries worst off. To address the endogeneity issue 2SLS regressions are run, with very similar instruments as the ones proposed by Burnside and Dollar (2000). Next to the governance indicators POLSTAB, VOICE and LAW, GDP per capita in PPP-terms[20], the population in 1990, the share of arms imports in total import (1990-1994 average) and the average annual growth of the CPI over the period 1985-1989[21] are included as instruments (all taken from the World Development Indicators, 2003). To capture strategical considerations, dummy's for Egypt (an important ally of the US), Sub-Saharan Africa (who get a large share of European aid), the Franc zone (receiving a lot of aid from France) and Central-America (in the sphere of influence of the US) are added. This model does very well in explaining variations in aid, especially for ODACAP (R^2=0.725) and ODACAPWDI (R^2=0.78), with most variables being significant on at least a 10% level and having the expected sign. The exogenous components[22] of the three aid variables do not show a significant relationship with inefficiency. In fact, all of the reported sensitivity analyses in the last two paragraphs lead to model (6) in Table 3, lending additional support to the robustness of this model specification. Hence, development assistance does not seem to contribute to better outputs for a given amount of resources, either by directly affecting outputs or by influencing government inefficiency. This result is broadly in line with – but also supplements – Bräutigam and Knack (2004), who find higher levels of aid intensity in African countries are associated with larger declines in the quality of governance and in tax revenues as a share of GDP, with some indication that the effect of aid on governance in the recipient countries is slightly less damaging in the 90s.

A caveat of the models in column (3) and column (6) in Table 3, is their weak performance on the Ramsey reset test of misspecification, while a Jarque-Bera test rejects the null hypothesis of normally distributed residuals in model (3)[23]. This may be most straightforwardly explained by the linearity of the relationship we imposed in the estimation model. When countries are ranked from most to least efficient, inefficiency scores rise faster towards the end of the sample (even after taking logarithms), reflecting wider disparity in inefficiency among the least efficient countries. Consequently, residuals

[20] Averaged over 1985-1989 except for Belarus, Romania and Yemen, where the observation for 1990 is used.

[21] Except for Belarus, Mongolia, Romania, Russia and Yemen where the 1990-1994 average is used.

[22] Regressions for the aid variables are run for all countries. The predicted values for Nicaragua for ODACAP and ODACAPWDI, but not for ODACAP$, are subsequently excluded.

[23] This test adds the estimated values of the dependent variable in some form to the regression and uses a F-test to check significance. In our case, three different tests are performed, adding $\hat{Y}^2$; $\hat{Y}^2$ and $\hat{Y}^3$; and $\hat{Y}^2$, $\hat{Y}^3$ and $\hat{Y}^4$ to the regression.

for these countries are strongly positive, revealing that a linear model has some difficulties to explain these higher inefficiency scores. Indeed, when we run the same regression as the one in column (6) of Table 3, excluding the last 5 observations (leaving us with 39 observations), the fit of the model increases sharply, normality of the residuals can no longer be rejected, and the Ramsey reset test no longer indicates misspecification.

However, simply dropping the least efficient governments from the sample is not an adequate response to the bad performance on the reset test. To improve the model in column (6) in Table 3 we add the quadratic terms of all the variables and the interaction terms of all the variables and DSAFR. A general to specific strategy, sequentially eliminating the most insignificant quadratic terms and interaction effects, leads to the model in Table 4. Normality of the residuals can no longer be rejected, and the Ramsey reset test no longer points towards misspecification.

Table 4: Specific Models Explaining Inefficiency, Including Quadratic and Interaction Terms.

CONSTANT	-0.060 (-0.52)	POLCON²	0.77** (2.47)
DSAFR	-1.36 (-1.62)	DSAFR*FDI	0.17** (3.66)
FDI	0.023 (1.40)	DSAFR*ILLITERACY	-0.0070** (-4.83)
ILLITERACY	0.005** (6.16)	DSAFR*POLSTAB	-0.50** (-2.92)
LAW	-0.32** (-3.56)	DSAFR*POPYOUNG	0.051** (2.95)
POLCON	-0.13 (-0.74)	DSAFR*PRIVHEALTH	-0.0049** (-2.68)
POLSTAB	-0.20** (-3.04)		
POPYOUNG	0.013** (4.55)		
PRIVHEALTH	-0.00043 (-1.64)		
R^2	0.95		
Adjusted R^2	0.93		
Observations	43		
Akaike	-1.82		
Schwarz	-1.20		

Note: Dependent variable is the natural logarithm of INEFFIC1. OLS estimates, White's heteroscedasticity-consistent standard errors are used to correct for possible heteroscedasticity. **(*) denotes significance at 5(10)%, t-values are reported in brackets.

The significance of most of the interaction terms and the large increase in the (adjusted) R^2 suggest we may have underestimated the heterogeneity in the sample. In particular, capturing the specificity of the Sub-Saharan African countries by a dummy variable is apparently too simplistic. The Sub-Saharan African countries show substantial slope heterogeneity. Nevertheless, most of the previously identified relationships still hold, but they appear to be stronger for Sub-Saharan African countries, at least for POPYOUNG, POLSTAB and PRIVHEALTH. FDI now only reduces efficiency for Sub-Saharan African countries. This could be due to rent extraction and rent shifting, given the important share of primary sector investments in total FDI in these countries. Adult illiteracy is generally associated with more inefficiency, but not for Sub-Saharan African countries: an F test does not reject the null hypothesis that the sum of the coefficients of ILLITERACY and DSAFR*ILLITERACY is zero. Political constraints particularly seem to affect efficiency when they reach very high levels.

A final problem is the potential endogeneity of POLCON. Laffont (2001, p. 34) reports a possible *"move towards more bureaucratic rules as a constitutional response to capture"*. Similarly, an inefficient government could be punished in subsequent elections by the electorate. Even if the election is won, the ruling party's majority could be slashed, limiting their room to maneuver. In both cases, more political constraints follow from high inefficiency. Yet, the opposite may also apply, in particular in developing countries. If anything, inefficient (and corrupt) governments try to expand their clout, for instance by passing laws which make it more difficult or even dangerous to oppose the government. Voters in developing countries may also resign themselves in their loss: inefficiency is often seen as an inherent element of governing, embezzled public funds as part of politicians' fringe benefits. As a result, we would expect that political constraints are fairly exogenous, and only scarcely affected by government inefficiency.

5 Conclusion.

The main aim of this paper was to identify the factors determining government inefficiency. As discussed, most authors initially did not find a robust relationship between productive spending categories and growth. Kneller, Bleaney and Gemmell (1999) have explained these counterintuitive results by a failure to account for distortionary taxes. We have argued a complementary explanation is failure to account for inefficiency. This claim was supported by a simple endogenous growth model that explicitly considers the role of inefficiency. Especially for developing countries it is very likely that inefficiency plays an even more important role than distortionary taxation, due to the income structure in these countries and the systematical occurrence of substantial inefficiencies.

Government inefficiency measures, relating public expenditure to outputs for health, education and government effectiveness, were estimated with DEA, a non-parametric linear programming-based technique designed to measure relative efficiency. These estimates reveal wide disparities in the way governments transform spending into relevant outputs. Sub-Saharan African countries perform very badly, while China, Russia, Sri Lanka and Thailand are among the most efficient countries.

Subsequently, a general to specific approach of regression analysis was adopted to search for the determinants of inefficiency. We find that government inefficiency is determined primarily by governance and political variables, like rule of law and political stability. In addition, structural country variables (in part reflecting past policies and past inefficiency) such as a large share of young people in total population, high adult illiteracy and low private health spending make it more difficult for governments to produce outputs for a given amount of public spending. Governments should therefore focus on strengthening rule of law and maintaining political stability to reduce inefficiency. When controlling for these variables, political constraints, limiting the ability of politicians to pursue their preferred course of action, hamper government efficiency. A final, perhaps unsurprising result, is that Sub-Saharan African countries are far less efficient than the other developing countries. A model variant that tries to take better account of the non-linearities in the data, reveals larger effects of the share of young people, private health spending and political stability for Sub-Saharan African countries. Political constraints seem particularly harmful when they reach very high levels.

Economic policy variables, representing the market orientation of a country, do not seem to be important for government inefficiency. Foreign direct investments are even associated with more, and not less, inefficiency. This effect is, however, mostly driven by the Sub-Saharan African countries in our sample, where investments are predominantly directed towards the primary sector, leading to rent shifting, rent extracting and – in the end – higher inefficiency. No relationship between ethnic diversity and inefficiency was uncovered, even when we allow for more complex connections between both variables. A final noteworthy result is that development assistance has not been able to lead to higher outputs for a given amount of resources. This may call for a revision in the way aid is dispensed.

Appendix.

Table A1: Government Inefficiency Scores.

Country	INEFFIC1	**Country**	INEFFIC1
China	1	Morocco	1.4269
Malawi	1	Zimbabwe	1.4333
Russia	1	Paraguay	1.4458
Sri Lanka	1.0239	The Gambia	1.4594
Thailand	1.0280	Ghana	1.4644
Bulgaria	1.0668	Namibia	1.4879
Philippines	1.1023	Nicaragua	1.4921
Belarus	1.1089	Swaziland	1.4993
Colombia	1.1205	India	1.5124
Vietnam	1.1278	Nepal	1.5267
Jordan	1.1290	Bolivia	1.6279
Fiji	1.1349	Ethiopia	1.6554
Tunisia	1.1480	Kenya	1.6863
Jamaica	1.1518	Algeria	1.6867
Peru	1.1856	Cote d'Ivoire	1.7552
Romania	1.2010	Yemen	1.9225
Mongolia	1.2225	Pakistan	1.9716
Indonesia	1.2310	Papua New Guinea	2.1642
Iran	1.2576	Madagascar	2.2129
South Africa	1.2758	Burundi	2.3504
Egypt	1.3164	Burkina Faso	2.5022
Syria	1.3364	Rwanda	2.5281
Dominican Republic	1.3558	Cameroon	2.6585
Turkey	1.3938	Congo, Rep.	2.9230
Ecuador	1.4001	Chad	3.3241
Lesotho	1.4251	Congo, Dem. Rep.	21.585

Table A2: Explanatory Variables in the General to Specific Approach

Variable	Definition and Source
	Structural country and past policy variables (World Development Indicators, 2003)
DEFENSE	Military expenditure (% of central government expenditure), 1990-1994 average
DLAM	Dummy for Latin-American countries.
DSAFR	Dummy for Sub-Saharan African countries.
GDPCAP	GDP per capita, PPP (current international $), 1985-1989 average, except for Belarus, Romania and Yemen (observation for 1990)
ILLITERACY	Illiteracy rate, adult total (% of population ages 15 and above), 1990-1994 average
NATRES	Employment in agriculture (% of total employment), 1990-1994 average
POPYOUNG	Population ages 0-14 (% of total), 1990-1999 average.
PRIVHEALTH	Private health expenditure per capita, PPP, obtained by multiplying PPP GDP per capita with private health expenditure as a % of GDP. 1990-1999 average.
URBAN	Urban population (% of total), 1990-1999 average.
	Governance indicators (Kaufmann, Kraay and Mastruzzi, 2003) for 1996, higher values indicate better performance.
CONTROLCORR	Control of corruption measures perceptions of (the eradication of) corruption, defined as the exercise of public power for private gain.
LAW	Rule of law. Comprises several indicators that measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts.
POLSTAB	Political stability and the absence of violence combines several indicators that measure perceptions of the likelihood that the government in power will be destabilized or overthrown by possibly unconstitutional and/or violent means.
VOICE	Voice and accountability measures the extent to which citizens of a country are able to participate in the selection of governments. Also included are indicators measuring press independence.

Variable	Definition and Source
	Political variables
ETHNIC	Ethnic fractionalization, based on a combination of linguistic and racial characteristics. For most countries this measure is available for the beginning of the 1990s. Source: Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg, 2002.
FHPOLRIGHTS	Freedom House (2004) political rights, 1990-1994 average. Higher values signify less political freedom.
FHCIVILLIB	Freedom House (2004) civil liberties, 1990-1994 average. Higher values signify less political freedom.
POLCON	Political constraints. Estimates the feasibility of policy change (i.e. the extent to which a change in the preferences of any one actor may lead to a change in government policy), thus reflecting the extent to which a given political actor is constrained in his or her choice of future policies. 1990-1994 average. Source: POLCONV variable, taken from Henisz (2000)
WAR	Dummy for countries involved in a armed conflict, with more than 1000 battle-related deaths per year, that continued till after 1989 or commenced before 1995. Source: Gleditsch, Wallensteen, Eriksson, Sollenberg and Strand, 2002
	External assistance
ODACAP	Net received official development assistance per capita, PPP. 1990-1994 average, for Belarus the 1995 bilateral exchange rate is used. Source: own calculations, based on World Development Indicators, 2003 (population, PPP and bilateral exchange rate with the US) and OECD, Statistical Compendium, edition 01#2003, Development and Aid, Geographical Distribution of Financial Flows to Aid Recipients – Flows, Total official development assistance net.
IMF	Dummy for countries under a IMF agreement between 1985 and 1990. Source: Przeworski and Vreeland, 2000; Namibia and Vietnam are both added with a value of 0. Namibia only gained independence in 1990 and, according to Bird (2001), was never under an IMF agreement in the period 1980-1996. Vietnam was excluded from IMF loans until 1993, due to payment arrears.

Variable	Definition and Source
Economic policy variables (World Development Indicators, 2003, except LIQLIAB)	
MONEYGROWTH	Money and quasi money growth (annual %), 1985-1989 average
LIQLIAB	Liquid liabilities (% of GDP), 1985-1989 average Source: Demirgüç-Kunt and Levine, 2001
EXPORT	Export of goods and services (% of GDP), 1985-1989 average, except for Belarus, Romania and Yemen (observation for 1990)
FDI	Foreign direct investment, net inflows (% of GDP) , 1985-1989 average

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